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Surgical drilling tool

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Specification

Surgical drilling tool

The invention relates to a surgical drilling tool with a cutting element which is encompassed over a partial length by a tissue protection sleeve.

Joining the bone fragments to one another by screws which can be screwed into them is known. To do this, first of all, using twist drills holes can be made in the bone fragments and then, by means of thread cutters, threads for holding screws are made in the bone fragments. The required holes or threads can be determined in their depth by using measurement devices in a complex manner. It goes without saying that measurement processes require great expenditure of time and labor which leads to unwanted prolongation of the duration of surgeries.

The object of the invention is to enable production of holes and threads in bone fragments in the short term with reliable depth determination.

As claimed in the invention it is provided that the cutting element is a drill; on its end facing away from the cutting edge a cylindrical shaft is formed which has a number of annular grooves or annular groove sections as drill hole depth markings at a distance from one another and which bears a tissue protection sleeve which move freely; its end on the side of the cutting edge forms a stop. The cutting element can be formed equally by a twist drill or a thread-cutting drill. In this way the cutting element is prepared for a predetermined depth, and the respective drill hole depth can be read by means of the displacements of the tissue protection sleeve on the clamping shaft on markings there. It corresponds to the inventive idea that the cutting element can be placed equally in aligned bone fragments overall or in bone fragments in which parts have prepared sliding holes for the screws.

It goes without saying that the tissue protection sleeve is applied either freely movably to the drilling tool so that when the stop makes contact with bone fragments or the known bone plates which are used as reinforcement, displacement motions of the tissue protection sleeve take place on the clamping shafts of the twist drills or thread-cutting drills, or however the tissue

protection sleeve on the clamping shaft-side end has a locking means and can be fixed by the locking means on the clamping shaft in order to enable drill hole depth determinations in this way by the locked tissue protection sleeve making contact with the bone fragments. Preferably the locking means is formed by a clamp locking mechanism, for example a ball locking mechanism; the balls of this mechanism are located in a recess which extends transversely to the lengthwise axis of the clamping shaft in a widened part of the tissue protection sleeve, they are placed by spring force against the clamping shaft and can be fixed in the contact position by means of an adjustment ring which extends over the widened area. Feasibly the annular grooves or annular groove sections which are located in the clamping shaft at least in part accommodate the balls of the locking mechanism, into which grooves the balls can be held by means of the adjustment ring. The adjustment ring is preferably provided with recesses which, when placed opposite the balls of the locking mechanism, allow their lifting, for example under the influence of the sliding force which take effect on the cutting element, while with assignment of the concentric sections which are located between the recesses, locking of the tissue protection sleeve is accomplished by holding the balls of the locking mechanism in the annular grooves or annular groove sections. In the locked state the tissue protection sleeve leads to self-actuated termination of the displacement of the cutting elements by support on the bone fragments or bone plates. For the user there is a mechanically perceptible measure for determining the depth of the drill holes or threaded holes, obviating the need for additional reading of the markings.

Furthermore, it is provided that the adjustment ring can be partially turned on the widened area between the release and locked position and that the release position and the locked position of the adjustment ring can be determined by the stops located on it and a pin which is fixed on the tissue protection sleeve and which is guided between the stops. By the interaction of the stops and the pin there is mechanically perceptible limitation of the partial rotations of the adjustment ring for the release or locking processes of the tissue protection sleeve on the cutting element.

Finally, it is still provided that the tissue protection sleeve on the end facing the cutting edges of the cutting elements bears a collar which adjoins the end face as the stop. The peripheral surface of the collar can be made in any shape, for example cylindrical, obliquely straight or convex or concave.

The invention is explained using embodiments.

Figure 1 shows a twist drill in a side view.

Figure 2 shows a twist drill as shown in Figure 1 with a tissue protection sleeve,

Figure 3 shows a twist drill with a tissue protection sleeve of another version, perspective view,

Figure 4 shows a thread-cutting drill in a side view,

Figure 5 shows a partial section of the thread-cutting drill of Figure 4;

Figure 6 shows a tissue protection sleeve of another version in a section, enlarged,

Figure 7 shows a fragment of a tissue protection sleeve of Figure 6 and

Figure 8 shows a tissue protection sleeve of Figure 6 in a bottom view.

In Figure 1 the twist drill is labeled 1; its end facing away from the cutting edges 2 adjoins a cylindrical clamping shaft 3. The clamping shaft 3 has at a spacing a number of markings 4 as the depth information. As can be seen in Figure 2, the clamping shaft 3 movably holds the tissue protection sleeve 5. The end 6 of the tissue protection sleeve 5 which faces the cutting edges 2 is used as a stop which by support on the bone fragments 7 or on the bone plates 8 (Figure 3) in drilling processes leads to displacement movements of the tissue protection sleeve 5 on the clamping shaft 3. The tissue protection sleeve 5 with its end facing away from the cutting edges 2 interacts with the markings 4 and allows the respective drilling or cutting depth to be read on them. It goes without saying that the tissue protection sleeve 7 on its end facing the cutting edges 2 can also have a collar 9 which is used as the stop for better support and for reducing the surface pressure. It is also possible to detect markings 4 for determining the drilling and cutting depth via a window 10 which is machined in the tissue protection sleeve 5.

Figure 4 shows a thread-cutting drill 11 with cutting teeth 26 which likewise has a cylindrical clamping shaft 3 on the back end. In the clamping shaft 3 a number of annular grooves 12 are made with axial spacing; they preferably interact with the tissue protection sleeve 5 for depth determinations. The tissue protection sleeve 5 has a ball locking mechanism 13. By means of the ball locking mechanism 13 the tissue protection sleeve 5 can be locked on the clamping shaft 3 of the thread-cutting drill. The ball locking mechanism 13 in the recesses 14 of the widened area 15 accommodates the balls 16 of the locking mechanism in a freely movable manner which are under the influence of helical springs 19 supported on pins 18 and which can be moved under their influence in the direction of the annular grooves 12. The widened area 15 bears an adjustment ring 20 which is adjustable on the widened area 15 via partial rotations. The adjustment ring 20 has recesses which when assigned to the balls 16 of the locking mechanism allow the latter to emerge from the annular grooves 12 under the influence of the component which takes effect on the cutting element transversely to the displacement force, while with assignment of the cylindrical intermediate sections 22 to the balls 16 of the locking mechanism locking of the latter in the annular grooves 12 is caused. The partial revolutions of the adjustment ring 20 can be limited by a groove 23 - pin 24 arrangement (Figure 7). The groove 23 is machined in the adjustment ring 20 for this purpose, while the pin 24 is located permanently on the tissue protection sleeve 13. The partial revolutions of the adjustment ring 20 can be limited by the pin 24 making contact with the ends 25 of the groove 23.

To produce a threaded hole, by means of the twist drill 1 (Figure 1) first a drill hole 27 into the bone fragments 7 can be produced (Figure 3). The depth of the drill hole 27 can be read according to the displacements of the tissue protection sleeve 5 on the clamping shaft 3. The tissue protection sleeve 5 can also be connected to the twist drill by locking by means of partial rotation of the adjustment ring 20 and the balls 16 of the locking mechanism which are fixed in the annular groove 12, and by mechanical support of the tissue protection sleeve 5 (Figure 3) on the bone fragments the drill hole depth is formed.

Subsequent use of the tissue protection sleeve 11 makes it possible to produce the threads. The depth of the thread can be read in turn by movable interaction of the tissue protection sleeve 5 with the markings 4 on the clamping shaft 3, or can be determined with the tissue protection sleeve 5 locked by its making contact with the bone fragments or bone plates 8.

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Claims

1. Surgical drilling tool with a cutting element which is encompassed over a partial length by a tissue protection sleeve, characterized in that the cutting element is a drill, on its end facing away from the cutting edge (2) a cylindrical shaft (3) is formed which has a number of annular grooves (12) or annular groove sections as drill hole depth markings at a distance from one another and it bears a tissue protection sleeve (5) in a freely movable manner, with its end on the cutting edge side which forms a stop (6).

2. Surgical drilling tool as claimed in claim 1, wherein a twist drill (1) or a thread-cutting drill (11) is used as the cutting element.

3. Surgical drilling tool as claimed in claim 1, wherein the tissue protection sleeve (5) on the clamping shaft-side end has a locking means (13) and can be fixed by the locking means (13) on the clamping shaft (3).

4. Surgical drilling tool as claimed in claim 2, wherein the locking means (13) is formed by a clamp locking mechanism.

5. Surgical drilling tool as claimed in claim 4, wherein the clamp locking mechanism is a ball locking mechanism with balls (16) which are located in a recess (14) which extends transversely to the lengthwise axis of the clamping shaft (3) in the widened part (15) of the tissue protection sleeve (5) and are placed by spring force (19) against the clamping shaft (3), and wherein the balls (16) of the locking mechanism can be fixed in the contact position by means of an adjustment ring (20) which extends over the widened area (15).

6. Surgical drilling tool as claimed in claim 5, wherein the annular grooves (12) or the annular groove sections which are located in the clamping shaft (3) at least in part accommodate the balls (16) of the locking mechanism and wherein the balls of the locking

mechanism can be held in the annular grooves or annular groove sections by means of the adjustment ring (20).

7. Surgical drilling tool as claimed in claim 5, wherein the adjustment ring (20) can be partially turned on the widened area (15) between the release and locked position and wherein the release position and the locked position of the adjustment ring (20) can be determined by the stops (25) which are located on it and a pin (24) which is fixed on the tissue protection sleeve and which is guided between the stops (25).

8. Surgical drilling tool as claimed in claim 1, wherein the tissue protection sleeve (5) on the end facing the cutting edges (2) of the cutting element bears a collar (14) which adjoins the end face as the stop and which is bordered peripherally by surfaces which are bent cylindrically, obliquely straight, or convexly or concavely.

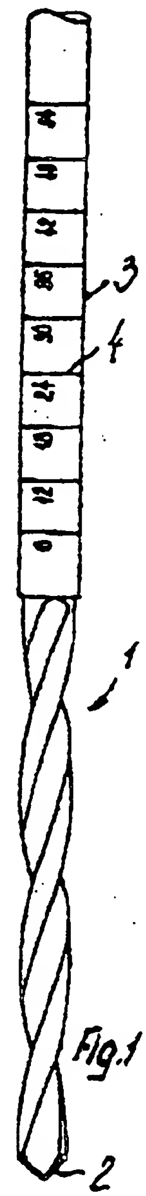

Fig.1

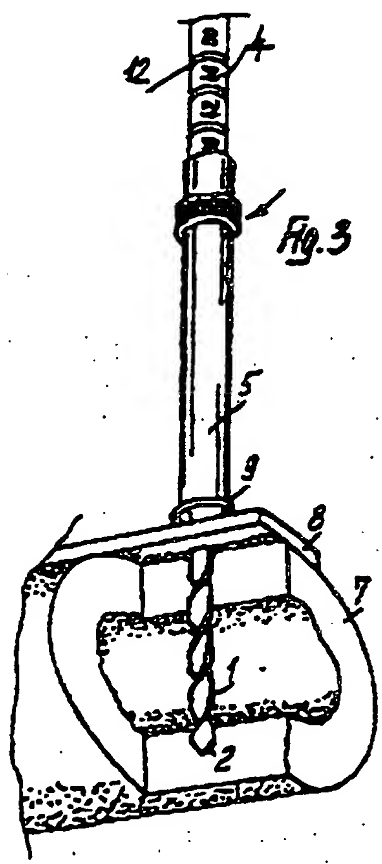

Fig.3

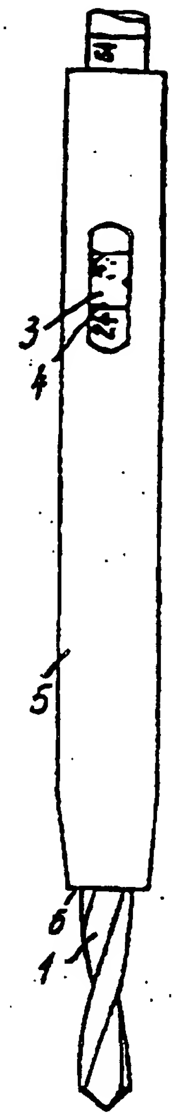

Fig.2

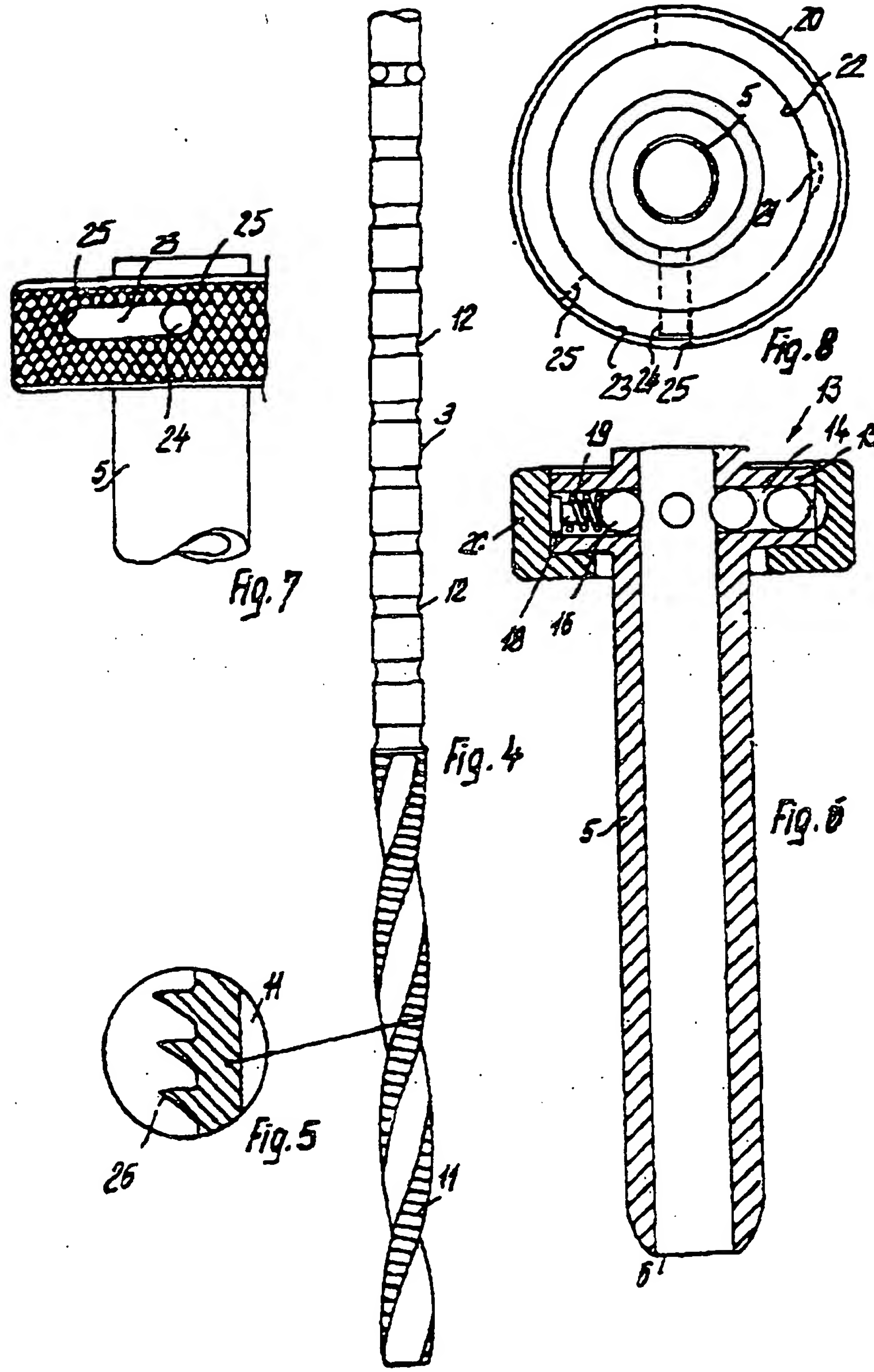

Fig.7

Fig.4

Fig.8

Fig.6

Fig.5